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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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07/06/81 07/06/81 07/06/81

EXAMINER

07/06/81
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711 W FIRST AVENUE
SPOKANE WA 99201-3828

ART UNIT	PAPER NUMBER
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07/06/81
DATE MAILED:

07/06/81

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/653,149	DERDERIAN ET AL.	
	Examiner	Art Unit	
	Thao P Le	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 11 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 26-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- | | |
|---|--|
| 15) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 18) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s) _____ |
| 16) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 19) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 17) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>3</u> | 20) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's election without traverse of Group II, directed to claims 1-25, in Page 7 is acknowledge. Claims 1-25 are remained for examination. Accordingly, claims 26-33 are canceled.

Information Disclosure Statement

2. The information disclosure statement submitted on 01/29/01 was filed after the mailing date of the Application on 08/31/00. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the petition is granted and the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 1, 4-9, 13-17, 19-20, 22-25 are rejected under 35 U.S.C. 102(a) as being anticipated by Deboer et al..

Referring to claim 1, Deboer et al. discloses the method of forming a capacitor basically similar to what recited in claim 1. See Figs. 1A-3C and Cols. 1-10. The method comprising the following steps:

. forming a first electrode 11 over a substrate 10;

- . atomic layer forming a conductive barrier layer 14 on 11;
- . forming dielectric layer 16 over 14;
- . forming a second capacitor electrode 17 over 16.

Referring to claim 13, (Also See Figs. 1A-3C and Cols. 1-10), Deboer et al. also discloses the method of forming a capacitor is similar as claimed:

- . forming a first electrode 11 over a substrate 10;
- . forming a first precursor 14 at least one monolayer thick over 12;
- . forming a second precursor on the first precursor, the two precursors will become 15, 15 can be considered as conductive barrier material;
- . forming a dielectric layer 16 over 15;
- . forming a second electrode 17 over 16.

Referring to claims 4-9 and 22-25, Deboer et al. discloses the method of forming a capacitor above wherein the barrier layer contacts the first electrode and the barrier layer is made of TiN or alloys (Abstract) (Claims 4-5, 22). Deboer et al. also discloses that the dielectric layer 16 is made of Tantalum oxide (lines 63-65, Col. 3). Inherently, tantalum oxide exhibits a K factor of greater than 7 (Claims 6, 23). Capacitor electrode 11 comprises polysilicon (lines 30-31, Col. 3) and the dielectric layer comprises Ta_2O_5 which contains oxygen (Claims 7-8, 24-25). The dielectric layer 16 is formed over the barrier layer (Claim 9).

Referring to claims 14-17, Deboer et al. discloses the method of forming a capacitor as claimed in claim 13, wherein the first and second precursor layers each is a monolayer and comprises saturated monolayers and either the same chemical species (tantalum) (Figs. 1A-1C) or different chemical species (23, 25, Fig. 2C).

Referring to claims 19-20, Deboer et al. discloses the method above wherein the dielectric layer is formed over the barrier layer and formed after the precursor. The thickness and density of the barrier layer can reduce oxidation of the first electrode by oxygen.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-3, 10-12, 18, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deboer et al. and further in view of Agarwal, U.S. Patent No. 6,218,256.

Regarding to claims 2, 10-11, Agarwal discloses the method of forming capacitor that is similar to Deboer et al's but clearly states that the temperature used is in the range of 100-500 oC and at 1.01-20 Torr (Cols. 7-8). The method also comprising the step of forming a conductive barrier layer 16 (Fig. 7) over the dielectric layer 14. The method of forming electrodes and dielectric layer occur by other than atomic layer deposition.

Referring to claims 3 and 21, it would have been obvious that the thickness of the barrier layer is one of desired choice. One would have been motivated to make it not too thick to have less space but not too thin to perform its function.

Regarding to claim 18, it would have been obvious that the material used to make precursors is also one of desired choice. Moreover, it would have been well known to a person having skill in the art to use the materials comprising W, Ta, NH₃, TiCl₄ as claimed to make precursors. It is well known that those materials are widely chosen to avoid oxidation diffusion of electrode and avoid the reaction between electrode and dielectric layer.


Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P Le whose telephone number is 703-605-1187. The examiner can normally be reached on M-F (8:30-5:30).


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Art Unit: 2818

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Thao Phuong Le
June 28, 2001



David Nelms
Supervisory Patent Examiner
Technology Center 2800